Dairy Research

By Larry Chase

Evaluating strategies that are practical, productive and profitable to reduce emissions.

Dairy cows, gases and climate change

Discussion is increasing on how climate will change, how it will impact agricultural production and how ruminants contribute to greenhouse gas emissions (GHG). Agriculture contributed 8.1% of the total US GHG emissions in 2012. These gases include carbon dioxide, methane and nitrous oxide. Ruminants produce methane as a result of enteric (rumen) fermentation. Enteric fermentation contributed 25% of total methane emissions. Dairy cattle accounted for 6.2% of total methane emissions or 0.54% of the total US GHG gas emissions.

A 5-year project, started in 2013, and funded by USDA (US Department of Agriculture) and NIFA (National Institute of Food and Agriculture), is focused on how to lower emissions from the dairy sector. The project titled "Climate change mitigation and adaptation in dairy production systems of the Great Lakes," includes New York, Wisconsin, Pennsylvania, Michigan, Ohio, Indiana and Illinois. These states account for about 36% of the total US milk production.

The University of Wisconsin-Madison is the lead institution. Cornell is one seven universities, four USDA research facilities, two companies and the Innovation Center for US Dairy that are cooperating on this project. Quirine Ketterings, Curt Gooch and Larry Chase are the investigators from Cornell.

This project has five main areas research and education, and includes:

1. Measurement – This group will monitor gaseous emissions from dairy cows, manure systems and manure application practices at the soil and crop level. One study will examine the relationships between genetics and NDF digestibility on milk production and methane emissions. Other workers will look at soil GHG emissions under varying growing conditions and crop rotations.

2. Modeling – This group will use a number of whole farm models to determine baseline emissions for a dairy farm and then evaluate the impact of management practice changes on GHG emissions. This could include factors such as crop rotations, crop types and manure application practices. The CNCPS (Cornell Net Carbohydrate and Protein System) model will be used to examine feeding program changes on methane and ammonia emissions. Another group will use models to predict climate change and adaptation scenarios.

3. Life cycle analysis (LCA) of dairy production systems – A LCA analysis is a process of obtaining and evaluating the inputs and outputs of energy and materials associated with a product or service system. The LCA process also examines related environmental impacts. This can be done on a farm or a total dairy system basis. The total system approach includes items such as transporting milk to the processing plant, processing and packaging milk, and hauling the milk products to retail locations.

4. Extension and outreach – This group will develop fact sheets and materials related to gaseous emissions on dairy farms. Regional conferences will be organized. Socio-economic impacts of best management practices and barriers to use on farms will be evaluated. On-farm demonstrations will be held. A website will be at www.SustainableDairy.com.

5. Education – The primary focus of this group is to develop materials and trainings for K through 12 educators. Undergraduate and graduate student curriculum will also be addressed.

Each group is in the initial phases. The modeling group is evaluating three whole farm models with data from a NY dairy that participated in the National Air Emissions Monitoring Study and had measured barn emissions data. A number of alternative strategies can be evaluated using models to assess which areas on the farm (crops, crop rotations, manure management, animal nutrition and animal management) will provide the best and most practical methods to lower emissions..❐

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